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UNUSUAL PESTS OF WOODY ORNAMENTALS

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An insect species that is not commonly considered an economic pest may occasionally occur in epidemic outbreaks on shade trees and shrubs. Although attacked by natural enemies and usually held in check, it may become sufficiently abundant to cause economic damage for a short time. At times a gall forming insect may cause a conspicuous abnormal growth that causes anxiety and apprehension for the grower even though no appreciable damage may result. In this article the writer wishes to record the information obtained concerning a number of such insects that have appeared in Ohio in recent years.

Honey Locust Pod Gall

The honey locust pod gall, caused by Dasyneura gleditschae O. S., occurred in an epidemic outbreak in Lake County in 1951 and again in 1957 and 1958. It appeared in great numbers on nursery trees of thornless honey locust. In 1958 thousands of such trees were growing in the nursery and practically all were infested. New leaflets in the growing tips failed to open but grew into oblong, rounded galls (Figure 1). Usually only one larva was found per gall but occasionally there were two.

Life History - In October 1957, when the honey locust leaves began to fall from the trees, the galls were found shelling from the leaves. In a careful examination of the debris under the trees, living midge larvae could be found inside the fallen galls. These were sufficiently small that they could be found only with

difficulty. It seemed evident as a result of this examination that the insect lived over winter in the larval stage in the debris under the trees. However, adult emergence was recorded as late as October 23.

By the end of June in 1958 empty pupal cases, adult midges, and eggs as well as larvae in various stages of growth could be found readily. This indicated that a complete generation had already developed on the tree.

Osten Sacken (1867) reported that adult midges emerged from galls during August and Butenmuller (1892) found adults present during July and August. In the Lake County Nursery, however, the insect could be found in all stages from the first of July until late fall. It was evident that several generations occurred during the year.

Parasitism - From a collection of galls made on July 5, 1951, a total of 37 midges and 25 parasites was recorded. The parasites were identified as Zatropis catalpae and Zatropis sp. Predaceous mites and thrips were also found inside many of the galls. By 1952 the population was sufficiently low that the grower was no longer concerned.

Following the severe infestation in 1957 natural enemies again became abundant in the summer of 1958 and by late September apparently again had the population under control. Leaflets that had formed galls opened after the insects left them and apparently functioned normally.

Control measures - In 1951 the infested trees were sprayed with DDT on July 6 and again about ten days later. Thereafter the infestation disappeared and the trees grew normally. It was

Figure 1. Honey locust pod galls caused by Dasyneura gleditschiae O. S.

assumed by the grower that sprays controlled the infestation although it is probable that the natural enemies were also an important factor.

When the infestation developed in 1957, the planting of thornless honey locust was much larger than in 1951 and nearly all of the trees became infested. Attempts at control were made by airplane applications of DDT and malathion, but results were inadequate. However, as a result of a growth forcing program the trees were growing rapidly. The proprietor stated that during a portion of the growing season the trees were growing one inch each day. Many trees grew from the bud to a height of more than seven feet during the season. This made it impractical to attempt to maintain a deposit of insecticide on the new growth. Three systemic insecticides were tested both as foliar sprays and as soil applications in 1958, but these depressed the population only temporarily. Although the grower suspected that the trees were being deformed, no permanent damage was apparent in October, after natural enemies had become abundant.

The European Willow Gall Midge

Galls on basket willow consisting of swellings in the stems (Figure 2) occurred in large numbers in a nursery in Lake County during 1957. The willow planting was maintained by the nursery in order to provide whips for use in tieing bundles of plants. The galls were caused by Rhabdophaga salicis Schr., the European willow gall-midge as described by Felt (1905 and 1924).

Galls occurred on nearly all of the willow stems in the planting and frequently two galls would occur on one stem. A

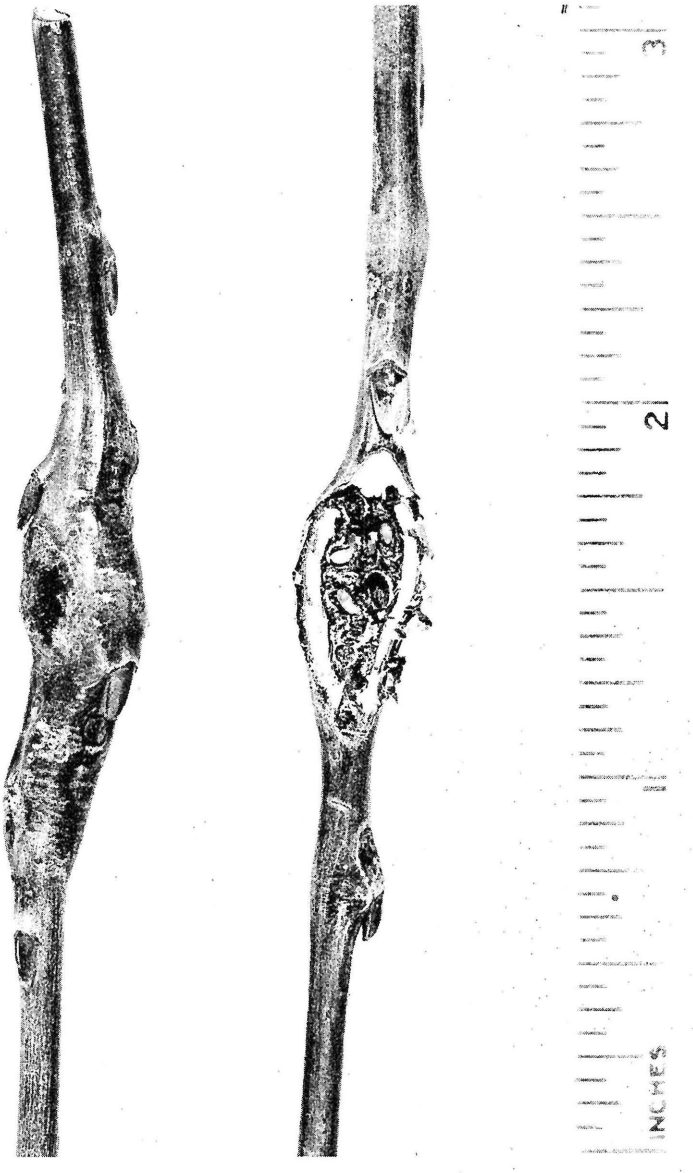

Figure 2. Galls caused by Phabdophaga salicis Schr. on basket willow. One cut open to show the larvae within.

number of larvae could be found in each gall and because the stems would break easily where the galls occurred the whips were useless for binding purposes.

Early in the spring of 1958 a total of 85 galls were collected and transported to Wooster where they were placed in a rearing cage in the insectary. The emergence of adult midges began on April 23 and continued until May 14 with the peak of emergence occurring on May 5. A total of 724 midges were obtained from the 85 galls. Hymenopterous parasites emerged in small numbers, but constituted less than four percent of the total emergence.

In an effort to prevent oviposition by the new brood, the willows were sprayed with DDT early in May. A 50 percent DDT powder was used at the rate of 2 pounds in 100 gallons of water. The willows grew normally during 1958 and no galls developed.

Juniper Midge

The work of the Juniper midge, Contariana juniperia Felt, (Felt-1939; Haseman and McLane-1940) in Ohio nurseries was discussed briefly in a previous publication (Neiswander 1951). Injury caused by this pest was first observed by the writer in two nurseries in Hamilton County in 1950. It occurred primarily on Juniperus virginiana canaerti, and J. virginiana glauca, and caused most damage on trees that were three to four feet in height. The injury consisted of dead twigs on all branches. A small larvae in boring into a twig one-half to three inches below the tip caused the death of the twig beyond that point. An occasional dead twig would break over, and by fall the brown

discoloration was conspicuous. Heavily infested plants were found in two nurseries, and one planting consisting of several acres was rendered unsaleable.

Life History - Only one generation of this species occurs each year. The larvae become full grown in late fall. At that time they are bright orange in color and measure approximately one-eighth inch in length. They drop to the ground and enter the soil where they remain during the winter.

Hibernating larvae were collected in Hamilton County early in April 1951. This was done by taking surface soil to a depth of approximately one inch under trees that had been heavily infested the previous season. Approximately 12 pounds of soil was taken to Wooster and placed in cages in the insectary. A total of 712 adult midges emerged from this material. Emergence began on May 8 and continued until May 22 with the peak of emergence occurring on May 17. The emergence of 176 parasites was also recorded. These were identified by C. F. W. Muesebeck as Platygaster spp.

Control - When the adult midges began to emerge early in May, the most heavily infested Juniper planting was sprayed with DDT at the rate of 1 quart of 25% emulsion in 100 gallons of water. No larvae could be found in the twigs of the sprayed trees during 1951 and by fall the trees had regained their normal color and were again saleable.

In the planting that had not been sprayed, larvae could be found readily during the latter part of the summer and dead twigs were evident. In 1952, however, the infestation was relatively low. Since that time no appreciable damage has been observed in Ohio, although the insect has been found each year by the state nursery inspectors.

Oligotrophus Sp.

In August, 1952, injury to Juniperus virginiana canaerti caused by larvae of another midge species was observed in a nursery in Lake County. This insect was identified by Dr. R. H. Foote as Oligotrophus sp.

The injury occurred only in the tips of twigs. These were killed, but the dead area did not extend more than one-fourth inch from the tip. On many trees, however, a relatively large percentage of the tips were infested. When examined early in August, a small orange colored larvae, similar to that of Contariana juniperia, was found in each tip.

Collections of infested tips were made on August 20, August 25, and September 4 and transported to Wooster where they were placed in cages in the insectary. Emergence of adult midges began on August 22 and continued until September 9. During this period a total of 323 adults emerged with the peak of emergence occurring on August 26. Parasites of the genus Platygaster emerged in greater numbers than did adult midges. A total of 665 parasites were obtained with the peak of their emergence occurring on August 31.

Specimens of the same type of injury on the same Juniper species were received from Indiana during June of the same year. From these specimens, however, adult emergence had occurred before the specimens were received. Only an occasional adult parasite could be found in the hollowed terminals.

The information available to date indicates that three broods of this insect occur each year with adults appearing early in the

spring, in June, and in August. However, the damage caused is not severe and natural enemies tend to hold it in check. No control measures were used in the nursery in Lake County in 1952, and during the following year the injury was very much reduced.

During the summer of 1956 injury caused by this species was observed in a nursery in Clark County, but no control measures were employed and by the following year the injury had disappeared.

Marginal Fold and Vein Pocket Galls on Oak Leaves

Two closely related species of midges that disfigure the foliage of pin oaks have caused much concern to home owners in Ohio, (Shanks 1955). They were identified by Dr. R. H. Foote as *Itonida foliora* Felt and *Itonida sp*. The two species of insects are similar in appearance and have similar life histories. It is not unusual to find both species on the same tree. The adults and full grown larvae measure between one and two milleters in length (Figures 3 and 4).

These insects have caused most trouble on pin oaks in Ohio, but have been observed in great numbers on red oak as well. They were particularly abundant in southwestern Ohio for a period of four years beginning in 1954. Pin oaks have been observed on which galls caused by one or both species (Figure 5) were present on nearly all leaves. When this occurs, the foliage is sufficiently deformed to reduce greatly the efficiency of the leaves.

Life History - The midge larvae live inside the galls throughout the summer. They become full grown in late summer and drop to the ground in September and October a short time before the leaves

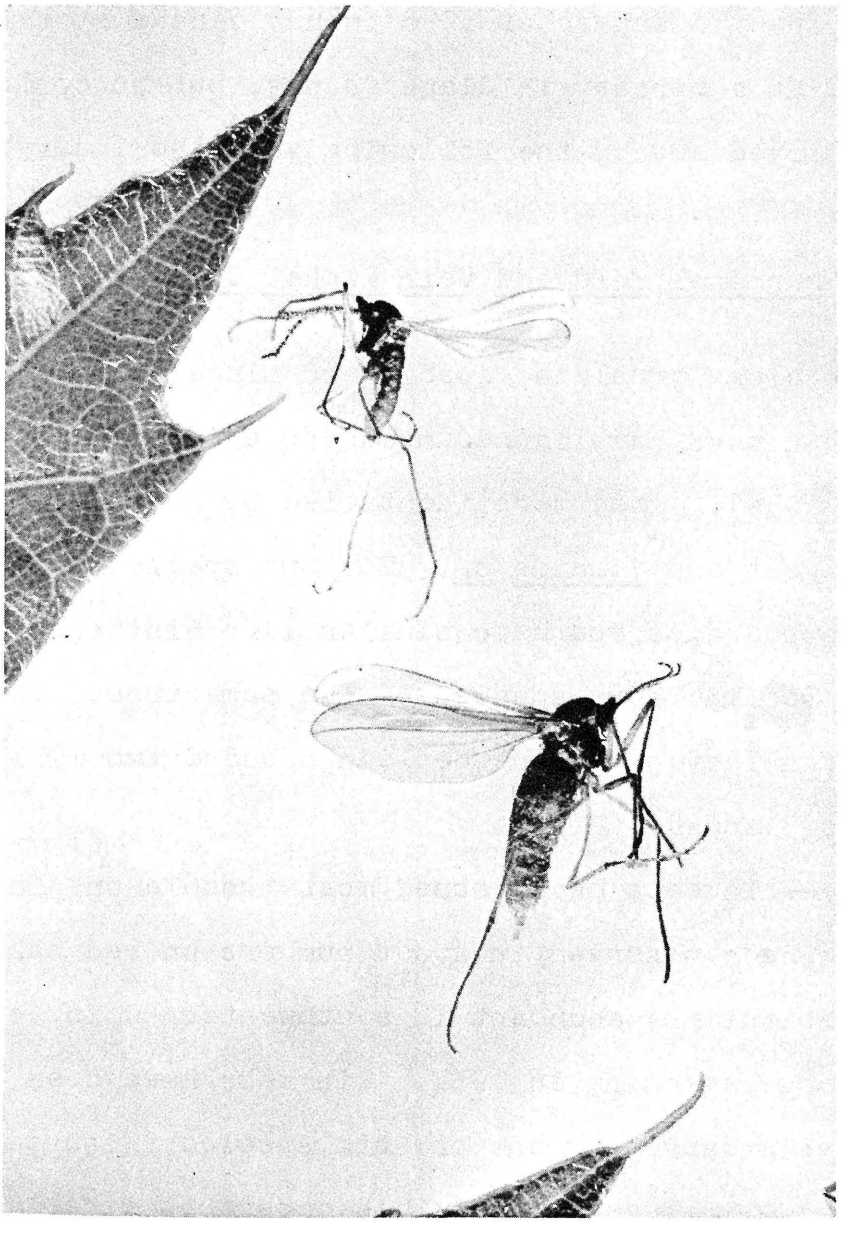

Figure 3. The marginal fold gall maker, Itonida foliora Hssl. and Hkr. (male and female).

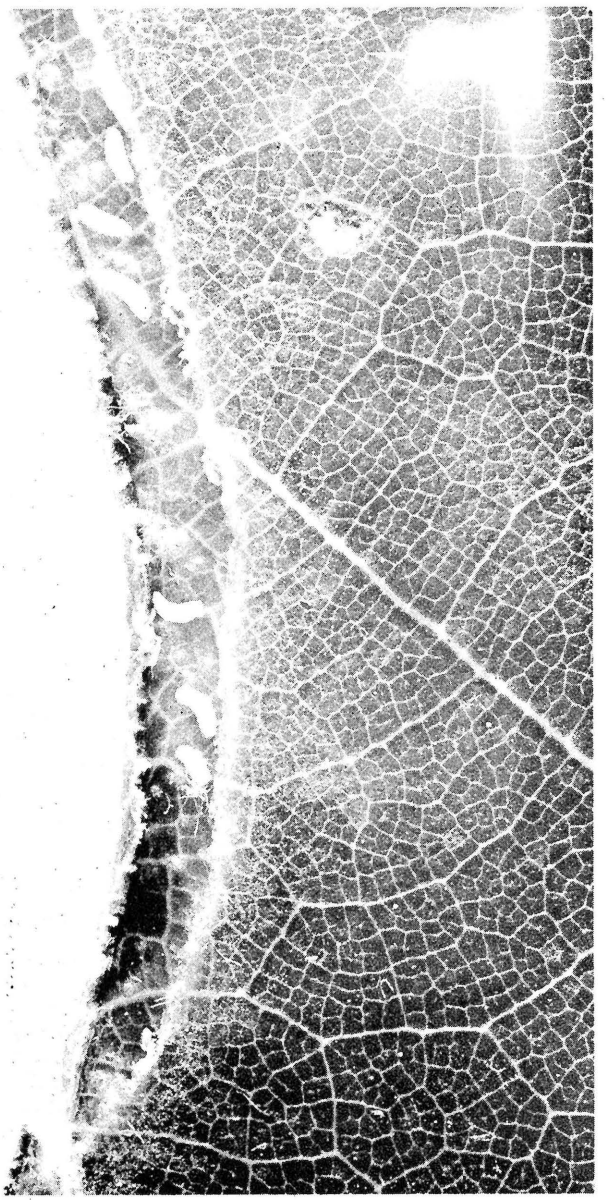

Figure 4. A marginal fold gall cut open to show midge larvae within.

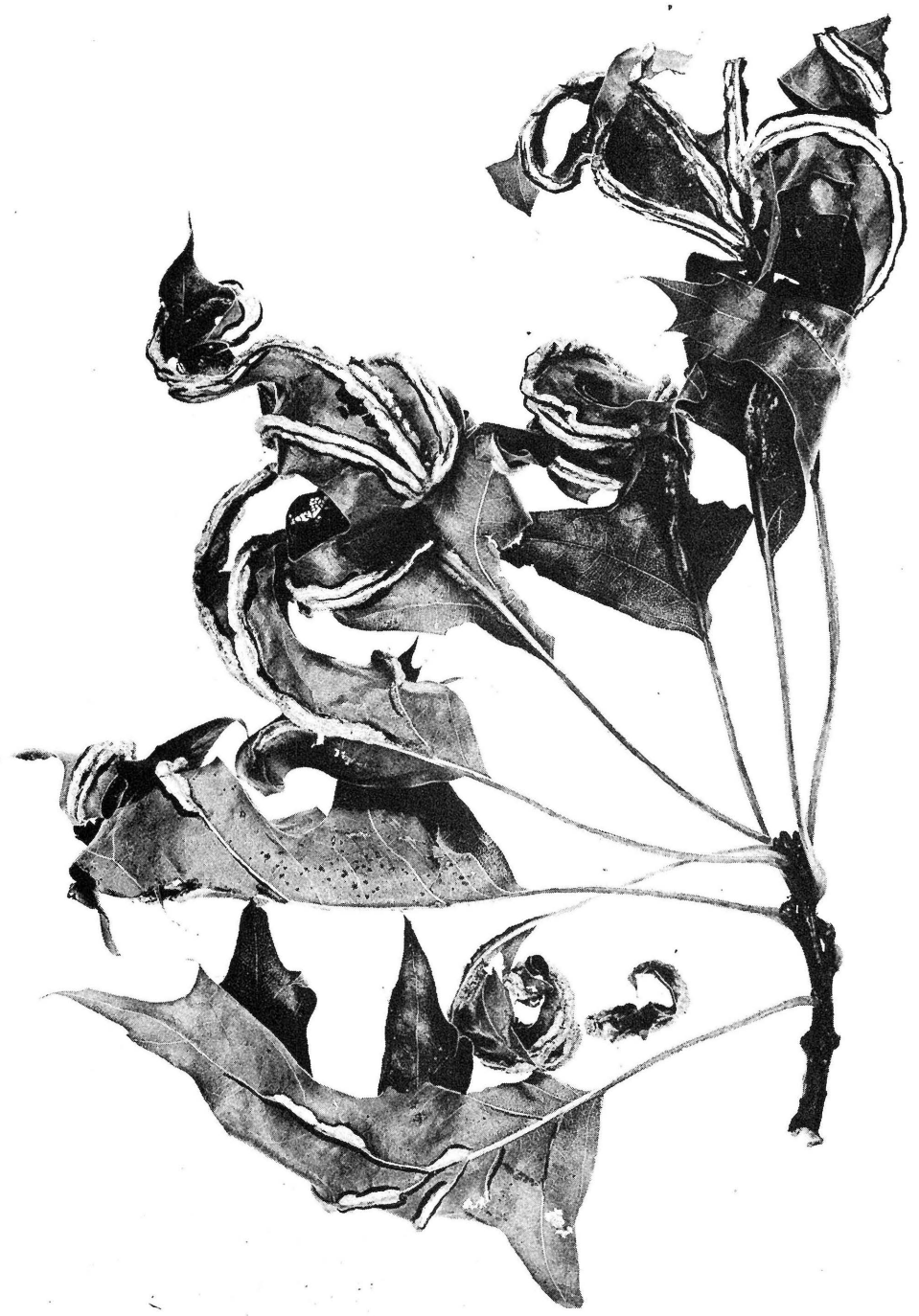

Figure 5. Pin oak leaves disfigured by vein pocket galls.

begin to fall. They live over winter in the soil, but usually are located within an inch of the soil surface.

The period of adult emergence varies from year to year, but occurs at approximately the time when buds are opening and new growth is beginning to appear on pin oaks. Most of the adults appear within a period of approximately one week. During 1955 emergence occurred between April 18 and April 29 with the peak of emergence occurring on April 20. On April 27 literally swarms of midges were seen in the grass under a large tree that had been heavily infested the previous season.

In 1956 adult emergence occurred between May 7 and May 15, and 93% of the emergence recorded occurred during the three-day period May 9 to 11 inclusive. A total of 799 midges were obtained from approximately eight pounds of surface soil taken under infested trees. In 1957 emergence again occurred during the latter part of April and eggs were found on the foliage by April 30.

Females were observed laying eggs one day after they had emerged. Eggs are deposited primarily on the lower surface of the leaves, one end being glued to the leaf. The eggs are oval in shape and reddish-orange in color. As many as 366 were counted on one leaf that was less than two inches long. The incubation period covered four to five days and the newly hatched larvae soon migrated to the upper surface of the leaf.

Larvae of Itonida foliora congregate along the margins of the leaf and in that area the leaf tissues soon begin to thicken and fold upward. In approximately two days the larvae are enclosed in galls.

Larvae of Itonida sp. congregate along both sides of the large veins. There the tissues begin to thicken and form a pocket which soon encloses the larvae.

Control - Soil treatments and foliage sprays were tested in control of both pests, but the results were not conclusive (Neiswander 1956). A spray containing chlordane applied liberally to the soil and plant growth under infested trees when the midges began to emerge, and a spray containing lindane applied to the foliage when the largest leaves were between one and two inches long, both appeared effective. However, it is questionable whether control measures are warranted. Infested groups of trees were observed in four areas of the State during 1954 and 1955 and all of these infestations disappeared almost completely by 1957.

The larvae are known to be attacked by natural enemies. Although no evidence was obtained of the work of hymenopterous parasites, predaceous mites and thrips were sometimes found in relatively large numbers inside the galls in the fall when the galls began to open.

Weather conditions also may help to govern the abundance of galls. In 1956 a large isolated pin oak located in Wooster was heavily populated with vein pocket galls, and on April 30, 1957 an average of approximately 15 eggs were found on the lower leaves. However, a period of cold weather occurred during the first few days of May and no galls developed in 1957 and none were observed in 1958.

When all of the foliage on a prized shade tree becomes distorted with galls, the rate of growth is reduced and the tree temporarily losses its ornamental value. Inasmuch as the owner of

the property usually becomes much concerned, control measures may be warranted. However, no permanent damage was evident on any of the trees under observation after the infestation disappeared.

The Ash Flower Gall

In 1956 a number of white ash trees being grown as shade trees attracted attention because of the conspicuous galls that appeared throughout each tree. Nearly all of the staminate blossoms developed into large green masses as shown in Figure 6. Such galls remain on the tree until fall and the property owner may suspect the tree has been inflicted with a fatal disease.

The galls are caused by an Eriophyid mite, Aceria fraxinivorus (Nal.) (Figure 7) which has a life history similar to that of Vasates quadripedes Shimer which causes the maple bladder gall. The mites appear in the blossom clusters early in the spring and remain there and continue to multiply during the summer. In late summer or early fall they leave the galls and congregate in folds or crevices of the bark. On October 10 they were found in relatively large numbers in such crevices near the base of an enlarged blossom cluster.

Inasmuch as the hibernating mites are in an exposed position, it is probable that the control measures employed for the maple bladder gall mite would be effective. These consist of a spray containing either lime sulfur or malathion applied in the spring before growth starts.

Noxious Oak Gall

The noxious oak gall occasionally causes damage to swamp white oak in Ohio. It is caused by the Cynipid gall maker, Neuroternus noxiosus (Bassett). A prized shade tree in a lawn in Elyria was so heavily infested in 1954 that 90 percent of the leaves were distorted (Shanks 1955). The twig growth was unusually short and the foliage appeared thin.

This gall maker is interesting in that two quite different generations occur each year and two distinct types of galls develop. Adults of the hibernating brood emerge in late March and April and consist only of females. These begin depositing eggs when the first foliage appears and their progeny develop in conspicuous leaf galls which involve the midribs and petioles of the leaves (Figure 8). Adults of the other generation consist of both males and females which emerge primarily in June. A total of 580 individuals emerged from 63 galls between June 12 and June 21. However, emergence had already begun when the galls were collected. The females of this generation deposit eggs in the tips of the growing twigs and the offspring develop in woody galls where they remain until spring (Figure 9).

The swamp white oak at Elyria was sprayed on April 20, 1955 with a combination of a DDT emulsion concentrate and a malathion wettable powder. Both materials were used at the rate of 1 pound of the toxicant in 100 gallons of water. The new growth on the tree averaged approximately one inch in length when the spray was applied.

Figure 6. Ash flower galls on white ash.

Figure 7. Ash flower gall opened to show mites within (greatly enlarged).

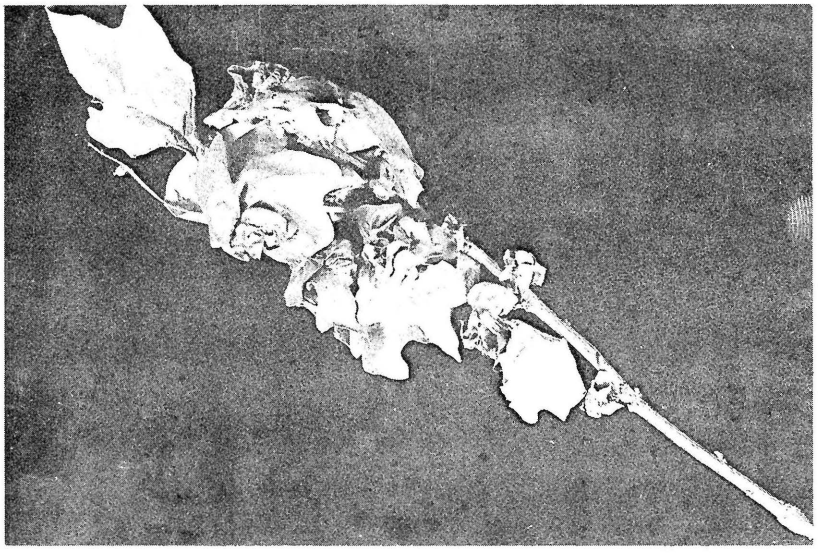

Figure 8. Leaf galls caused by the Noxious oak gall maker.

Figure 9. Woody gall caused by the Noxious oak gall maker.

The succulent foliage was burned slightly by the combination of insecticides, but the insect was apparently controlled effectively. Only an occasional gall developed in 1955. The tree grew more vigorously and appeared normal that year but by 1958 it was again heavily infested.

The Hickory Gall Aphid

Galls caused by the hickory gall aphid, Phylloxera caryaecaulis Fitch, sometimes occur on the twigs and petioles of prized hickory trees in large numbers (Figure 10). The swellings vary from one-fourth to one inch in diameter and frequently gridle twigs, causing them to die and break at the point where a gall occurs. Large trees have been observed that were noticeably weakened because of the loss of foliage.

The gall makers live over winter as tiny black eggs located on the twigs in crevices of the bark. The eggs hatch in the spring when the buds begin to swell, and the newly hatched aphids congregate on the swelling buds. As many as 12 were counted on one bud. The insects begin feeding as soon as green tissue is available, and galls that completely enclose the insects soon form in the rapidly growing twigs and leaf stems. The galls are almost spherical in shape and at first are green in color, but turn brown or black in early summer as they break open and the insects escape.

Figure 10. Twig galls on hickory caused by the hickory gall aphid. Photo taken after the galls were open and the insects no longer present.

In 1953 a large tree that had been heavily infested with galls during the two previous seasons was sprayed with malathion in an attempt to control the gall maker (Neiswander 1944). The work was done in cooperation with the Charles F. Irish Company, and the spray was applied on May 7 when the eggs were hatching in large numbers. Only an occasional gall developed on the tree in 1953 and none were observed in 1954.

Literature Cited

Felt, E. P. 1905. N. Y. State Mus. Mem. 8, Vol. 1, pp. 299-302.

Felt, E. P. 1924. Manual of tree and shrub insects. The MacMillan Company

Felt, E. P. 1939. A new Juniper midge (Diptera: Cecidomyiidae) Ent. News 50:159-160.

Haseman, Leonard, and S. R. McLane. 1940. The history and biology of the Juniper midge (Contarinia juniperiana Felt). Ann. Ent. Soc. Amer. 33:612-615.

Neiswander, R. B. 1951. Some tree pests in the midwest. Proc. 27th Nat. Shade Tree Conf. pp. 83-92.

Neiswander, R. B. 1954. The control of some gall makers. Proc. 30th Nat. Shade Tree Conf. pp. 14-20.

Neiswander, R. B. 1954. Some economic gall makers that attack shade trees. Proc. 11th Ann. Meet. North Central Branch, E.S.A. pp. 18-19.

Osten Sacken. 1867. Two new North American Cecidomyiidae. Proc. Ent. Soc. Phila. 6:219-220.

Shanks, Carl Harmon, Jr. 1955. Investigations of some gall-forming insects of economic importance. Unpublished Thesis. Ohio State University.